

An Advanced Certain Trust Model Using Fuzzy Logic and Probabilistic Logic theory

Kawser Wazed Nafi^{1,4}, Tonny Shekha Kar^{1,4}, Md. Amjad Hossain^{2,4}, M.M.A Hashem^{3,4}

¹Lecturer, Computer Science and Engineering, Stamford University Bangladesh,

²Assistant Professor, Computer Science and Engineering,

³Professor, Computer Science and Engineering,

⁴Khulna University of Engineering and Technology, Bangladesh

Abstract—Trustworthiness especially for service oriented system is very important topic now a day in IT field of the whole world. Certain Trust Model depends on some certain values given by experts and developers. Here, main parameters for calculating trust are certainty and average rating. In this paper we have proposed an Extension of Certain Trust Model, mainly the representation portion based on probabilistic logic and fuzzy logic. This extended model can be applied in a system like cloud computing, internet, website, e-commerce, etc. to ensure trustworthiness of these platforms. The model uses the concept of fuzzy logic to add fuzziness with certainty and average rating to calculate the trustworthiness of a system more accurately. We have proposed two new parameters - trust T and behavioral probability P, which will help both the users and the developers of the system to understand its present condition easily. The linguistic variables are defined for both T and P and then these variables are implemented in our laboratory to verify the proposed trust model. We represent the trustworthiness of test system for two cases of evidence value using Fuzzy Associative Memory (FAM). We use inference rules and defuzzification method for verifying the model.

Keywords—Certain trust; Certain Logic; Fuzzy Logic; Probabilistic Logic; FAM rule; Fuzzification; Defuzzification; Inference Rules.

I. INTRODUCTION

TRUST is a well-known concept in everyday life and often serves as a basis for making decisions in complex situations. There are numerous approaches for modeling trust concept in different research fields of computer science, e.g., virtual organizations, mobile and P2P networks, and E-Commerce. The sociologist Diego Gambetta has provided a definition, which is currently shared or at least adopted by many researchers. According to him "Trust is a particular level of the subjective probability with which an agent assesses that another agent or group of agents will perform a particular action, both before he can monitor such action and in a context in which it affects its own action" [1].

The trustworthiness of the overall system depends on the following things:

a) *The trustworthiness of the subsystems and atomic component independently from how these trust values are assessed.*

b) *Information on how the system combines its subsystems and components.*

c) *The knowledge about which subsystems and components are redundant.*

Therefore, a major challenge of serving trust for the overall system is needed to consider that in real world applications the information about the trustworthiness of the subsystems and components itself is subject to uncertainty [1-4]. Besides, evaluating the models for the trustworthiness of complex systems are needed to be capable of modeling the uncertainty and also calculate and express the degree of uncertainty associated to the derived trustworthiness of the overall system. Trust is interrelated with people's everyday life. When people want to do some new things like selling or buying things from one to other, finding new materials from different source or some other things, concept of trust then arise. In the field of computer science and virtual world of modern technologies like virtual organizations, mobile or P2P networks and E-commerce [5-7], trust is very important. One to one conversion, data sharing is fully dependent on this trust on something. Different trust models have been developed now a day for serving this trustworthiness in the virtual communication world which is seen mostly worked on uncertainty.

Following the day by day improvements of the internet of services, the future internet based on Cloud computing IT systems will become highly distributed, dynamically composed and will be hosted and managed by multiple parties. But it is sorry to say at present people, enterprises, officials, organizations and corporate farms are still hesitating and feeling less of security and safety to move to the Cloud [8-10]. The reasons behind this are missing transparency, security concerns. So, both the users and providers and accreditation authorities are interested in evaluating the trustworthiness of a service, infrastructure or platform.

It is evident that the evaluation of the trustworthiness of complex systems is one of the major challenges in current IT research. Different trust models are now present in the world, which are dependent on uncertainty. [11-15] A new proposed model for solving this problem is Certain Trust Model (CTM) [1] which is used to calculate the trust of a system depending on recommendation of some experts, means on some certain values.

But, this model has some limitations. It has failed to apply fuzzy logic, probabilistic logic. This model is developed on the basis of human understanding. But for machine understanding and taking decisions, fuzzy logic is much helpful [16]. Again, it